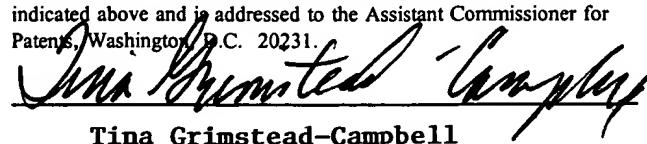


# APPENDIX I

"EXPRESS MAIL" Mailing Label Number EI267842785US

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Tina Grimstead-Campbell

# APPENDIX I

## Checks Done On Renumbered Java Byte Codes

Get the instruction. The numeric value of the instruction implicitly contains the instruction type:

```
insn = getpc(-1);
```

Implement some pre-execution checks based on this:

```
/*
 * Check input stack state. By renumbering the byte codes we can
 * perform the necessary security checks by testing if the value of the
 * byte code (and hence the byte code) belongs to the correct group
 */
if (insn <= TYPE9_END) {
    if (insn <= TYPE1_END) {
        check_stack_int(1);
    }
    check_stack_int(0);
}
else if (insn <= TYPE12_END) {
    check_stack_ref(0);
}
else if (insn <= TYPE11_END) {
    push(1)
}
```

Finally, implement some post execution checks:

```
/*
 * Set output stack state.
 */
if (insn <= TYPE8_END) {
    if (insn <= TYPE6_END) {
        if (insn >= TYPE6_START) {
            pop(1);
        }
        pop(1);
    }
    pop(1);
}
else if (insn <= TYPE10_END) {
    set_stack_int(0);
}
else if (insn >= TYPE11_START && insn <= TYPE16_END) {
    set_stack_ref(0);
}
```

## Reordering of supported Java byte codes by type

```
/* TYPE 3 */

#define s_POP2          0
#define s_IF_ICMPEQ    1
#define s_IF_ICMPNE    2
#define s_IF_ICMPLT    3
#define s_IF_ICMPGE    4
#define s_IF_ICMPGT    5
#define s_IF_ICMPL    6
#define s_IF_ACMPEQ    7
#define s_IF_ACMPNE    8

/* TYPE 6 */

#define TYPE6_START     9
#define s_SASTORE       9
#define s_AASTORE      10
#define s_BASTORE      11
#define TYPE6_END       12

/* TYPE 1 */

#define s_IADD          13
#define s_ISUB          14
#define s_IMUL          15
#define s_IDIV          16
#define s_IREM          17
#define s_ISHL          18
#define s_ISHR          19
#define s_IUSHR         20
#define s_IAND          21
#define s_IOR           22
#define s_IXOR          23
#define TYPE1_END       23

/* TYPE 2 */

#define s_ISTORE         24
#define s_POP            25
#define s_IFEQ          26
#define s_IFNE          27
#define s_IFLT          28
#define s_IFGE          29
#define s_IFGT          30
#define s_IFLE          31
#define s_TABLESWITCH   32
#define s_LOOKUPSWITCH  33
#define s_IRETURN        34

/* TYPE 7 */

#define s_SALOAD         35
#define s_AALOAD         36
#define s_BALOAD         37

/* TYPE 9 */

#define s_INEG           39
#define s_INT2BYTE      40
#define s_INT2CHAR      41
#define TYPE9_END        41

/* TYPE 8 */

#define s astore         42
#define s areturn        43
```

```

#define s_ATHROW          44
#define s_IFNULL           45
#define s_IFNONNULL        46

#define TYPE8_END          46

/* TYPE 12 */

#define s_ARRAYLENGTH      47
#define s_INSTANCEOF        48

#define TYPE12_END          48

/* TYPE 10 */

#define s_SIPUSH            49
#define TYPE10_END          49

/* TYPE 5 */

#define s_ILOAD             50
#define s_ALOAD             51

/* TYPE 11 */

#define TYPE11_START        52
#define s_ACONST_NULL        52
#define s_LDC2              53
#define s_JSR               54
#define s_NEW               55

#define TYPE11_END          55

/* TYPE 16 */

#define s_NEWARRAY          56
#define s_CHECKCAST          57

#define TYPE16_END          57

/* TYPE 13 */

#define s_DUP               58
#define s_DUP_X1             59
#define s_DUP_X2             60
#define s_DUP2              61
#define s_DUP2_X1            62
#define s_DUP2_X2            63
#define s_SWAP              64

/* TYPE 14 */

#define s_INVOKEVIRTUAL      65 /* 01000001 */
#define s_INVOKEONVIRTUAL     66 /* 01000010 */
#define s_INVOKESTATIC        67 /* 01000011 */
#define s_INVOKEINTERFACE     68 /* 01000100 */

/* TYPE 15 */

#define s_GETSTATIC          69
#define s_PUTSTATIC          70
#define s_GETFIELD           71
#define s_PUTFIELD           72

/* TYPE 4 */

#define s_NOP                73
#define s_IINC               74
#define s_GOTO               75
#define s_RET                76
#define s_RETURN             77

```